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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Kazunori Yamamoto

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FRISHAUF, HOLTZ, GOODMAN & CHICK, PC
220 Fifth Avenue
16TH Floor
NEW YORK, NY 10001-7708

EXAMINER

LEGESSE, HENOK D

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/583,841	Applicant(s) YAMAMOTO ET AL.	
	Examiner HENOK LEGESSE	Art Unit 2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,4,7 and 9-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,7 and 9-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections – 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1,3,4,7, and 9-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hotomi (US 5,477,249) in view of Anderson et al (US 6,017,112) and Morikoshi et al (US 6,382,754).

Regarding claim 1, Hotomi teaches an electrostatic attraction type liquid ejection apparatus (figs.1-3, col.4 lines 6-13,30-37,59-66) comprising:

a liquid ejection head (1, figs.1-3) having a nozzle (15).

an ejection voltage supply (20 which constitute elements 9, 17, 18, and 19) to apply an ejection voltage to a solution (6) inside the nozzle (15) so as to charge the solution (col.4, lines 1-14, 55-66), the ejection voltage supply (20) including an electrode (9) which contacts with the solution (6) to charge the solution (6) (see figs.1-3, and col.2, lines 35-37, col.4, lines 7-9,59-61);

a convex meniscus generator (14 which constitute elements 9, 10, 11, and 12) to cause the solution (6) inside the nozzle (15) to rise from the nozzle (15) in a convex shape (meniscus "lm" in fig.2) (col.3, lines 46-58, col.4, lines 24-29); and

an operation controller (13, fig.1) to control application of a drive voltage to drive the convex meniscus generator (14) and application of the ejection voltage by the ejection voltage supply (20) so that the drive voltage to the convex meniscus generator (14) is applied in timing corresponding to the application of a pulse voltage as the ejection voltage by the ejection voltage supply (20) (see the different ways of applications of vibrational and electrostatic energy to effect the ink drop in col.4, lines 38-55).

Hotomi further teaches a nozzle hole having a diameter of about 20 μ m to 200 μ m (col.3, line 61). Hotomi further teaches an operation controller (13, fig.1) that controls the application of voltage to the solution (6) inside the nozzle (15) so as to charge the solution and eject droplets ("ld", fig.3) of solution (6) on to a substrate (16) (col.4, lines 1-14, 55-66).

However, Hotomi fails to expressly teach a nozzle with an inner diameter of at most 15 μ m. Hotomi further fails to expressly teach the operation controller controls the

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application of a voltage having reversed polarity to the ejection voltage to be applied by the electrode to the solution inside the nozzle just before or just after the ejection voltage is applied to the solution inside the nozzle.

From the same endeavor Anderson et al teaches a nozzle with an inner diameter of at most 15 μ m (col.3, lines 16-26).

From the same endeavor Morikoshi et al teaches controller (figs.2, 3, 19, 23) that controls the application of a voltage with reversed polarity to the ejection voltage just before or just after the ejection voltage is applied by an electrode to the ejection actuator (9) (see figs.5 (e), 6, 24(a), col.9, line 42- col.10, line 7, col. 17, lines 47-63; see in the figs. 5 (e), 6, 24(a); following the application of the pulse voltage rising in rectangular shape a pulse voltage falling in a rectangular shape is applied i.e. the falling pulse voltage is in reverse polarity with respect to the rising pulse voltage) in order to effectively attenuate the kinetic energy of the meniscus and to hold the meniscus at apposition suitable for jetting out the next droplet to provide a stable print output (abstract, figs.5, 6, 24(a)).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made; to have formed the diameter of the nozzles of Hotomi to be at most 15 μ m as taught by Anderson et al, and to configure the controller of Hotomi such that the controller controls application of voltage with reversed polarity to the ejection voltage just before or just after the ejection voltage is applied to the ejection actuator of Hotomi based on the teachings of Morikoshi et al. The motivation being in order to able the liquid ejecting head eject smaller ink droplets improving the resolution

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of the ejecting head thereby the quality of the image formed, and to effectively attenuate the kinetic energy of the meniscus and to hold the meniscus at apposition suitable for jetting out the next droplet to provide a stable print output (abstract of Morikoshi et al).

Regarding claim 3, Hotomi further teaches the operation controller (13, fig.1) applies the drive voltage to the convex meniscus generator (14) in advance, and also in the timing corresponding to the application of the ejection voltage by the pulse voltage as the ejection voltage supply (20) (col.4, lines 38-55).

Regarding claims 4 and 7, Hotomi further teaches a liquid ejection head includes a plurality of nozzles each of which has a corresponding one of the convex meniscus generator (col.5, lines 11-21; see fig.14-16, and fig.18-19 shows the sectional views and parts of multi-nozzle head).

Regarding claim 9, Anderson et al further teaches wherein the inner diameter of the nozzle is between 0.2 μm and 8 μm (col.3, lines 16-26).

Regarding claim 10, Hotomi as modified by Anderson et al and Morikoshi et al above teaches substantially the claimed invention, Hotomi teaches a nozzle having diameter of about 20 μm to 200 μm (col.3, line 61), and Anderson et al teaches a nozzle having diameter of 5 μm to 29 μm (col.3, lines 16-26).

Hotomi as modified by Anderson et al and Morikoshi et al fails to explicitly teach that the inner diameter of the nozzle is between 0.2 μm and 4 μm .

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have formed the diameter of the nozzles to be between 0.2 μm and 4 μm in order to eject even smaller volume of droplets, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claims 11 and 12, Hotomi further teaches an opposing electrode (17 in figs.1-4) having an opposing surface which faces a top portion of the nozzle (15) and which supports a substrate (16).

Regarding claim 13, Hotomi teaches in figures 1-4 wherein the opposing electrode (17) is provided to face the top portions of a nozzle (15). However, the single nozzle shown in figs.1-4 is for illustration purpose and Hotomi teaches liquid ejection apparatus having a plurality of nozzles to print on media substrate 16 (fig.5,14-16, and fig.18-19 shows the sectional views and parts of multi-nozzle head). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to recognize that the opposing electrode which supports media substrate 16 is provided in common for the plurality of nozzles.

Regarding claim 14, Hotomi further teaches wherein the ejection voltage supply (20 which constitute elements 9, 17, 18, and 19) is provided in common for the plurality of nozzles (see fig.5,14-16, and fig.18-19 shows the sectional views and parts of multi-nozzle head and also see the rejection of claim 13 above) so as to apply the ejection voltage to the solution (6) inside each of the plurality of nozzles (15).

Regarding claim 15, Hotomi teaches as modified by Anderson et al and Morikoshi et al further teaches the liquid ejection apparatus (figs 1-4 of Hotomi) is provided in an ink jet printer such as shown in fig.1 of Anderson et al.

Regarding claim 16, Hotomi further teaches wherein the inner diameter of the nozzle (512 in fig.17) is uniform through a length of the nozzle (512) (Note also the use of different shaped nozzles is well known in the art).

Regarding claim 17, Hotomi further teaches wherein the inner diameter of the nozzle (15 in figs.1-4, 512 in figs.13,16) is tapered (col.3 line 64, col.8 line 38).

Regarding claim 18, Hotomi further teaches wherein the inner diameter of the nozzle (15 in figs.1-3, 512 in figs.13,16) is larger at a solution-chamber (5 in figs.1-3, 513 in figs.13,16) side of the nozzle (15,512) and gradually decreases toward an ejection-opening side of the nozzle (15,512).

Regarding claim 19, Hotomi further teaches wherein the nozzle (15 in figs.1-3, 512 in figs.13,16) has a substantially conical shape.

Regarding claim 20, Hotomi further teaches wherein the nozzle (15 in figs.1-3) has a height of approximately 100 μm (see col.3, lines 59-60, the thickness of nozzle plate 4 is about 25 μm to 1mm= 1000 μm).

Response to Arguments

4. Applicant's arguments filed 02/11/2009 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., negative and positive voltages) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to applicant's argument that the reference Morikoshi et al does not teach voltage having a reversed polarity to the ejection voltage, in the figs. 5 (e), 6, 24(a); following the application of the pulse voltage rising in rectangular shape a pulse voltage falling in a rectangular shape is applied. That is the falling pulse voltage is in

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reverse polarity with respect to the rising pulse voltage. The falling rectangular voltage is used in order to attenuate the kinetic energy of the meniscus and to hold the meniscus at apposition suitable for jetting out the next droplet to provide a stable print output. These voltage wave forms shown in figs. 5 (e), 6, 24(a) are similar to the wave form shown in fig.4 of the applicant's drawing.

In response to applicant's argument that the voltage wave forms and the controlling of these wave forms as taught by Morkoshi et al can not be bodily incorporated in the voltage waveform driving system of Hotomi, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Applicant is also reminded that arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENOK LEGESSE whose telephone number is (571)270-1615. The examiner can normally be reached on Mon.- Fri. Between. 8:00 AM-6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MATTHEW LUU can be reached on (571)272-7663. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MATTHEW LUU/
Supervisory Patent Examiner, Art Unit 2861

H.L.
04/23/2009